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Effect of Modifiable factors on Systolic Blood Pressure (SBP) in Elderly Population: A study from a tertiary care hospital in Delhi

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Abstract *— Hypertension (HTN) is a major public health problem in all age group but isolated systolic hypertension (ISH) is the commonest form of hypertension in elderly population and it is a better predictor of cardiovascular morbidity and mortality compared to diastolic blood pressure. Aim of the present study is to evaluate the effectiveness of modifiable factors on systolic blood pressure (SBP) in elderly population on systolic blood pressure in elderly patients. This prospective observational study was conducted on the patient attending OPD & IPD of HAHC Hospital, Jamia Hamdard, New Delhi. All the elderly hypertensive with elevated systolic BP were included in the study, after explaining the details about the study and taking written consent data were recorded on a proforma. The patients were followed every regularly and the effect of drugs on SBP were assessed and recoded at monthly interval. Data were analysed by using IBM SPSSv20. This study documented that among the 220 hypertensive patients who completed the study 51% were female. The maximum numbers of patients were from of age group of 56 to 65 years (44.54%). This study also shows that 40.90% patients were tobacco user. Morbidity and mortality are increased by elderly hypertension. The number of elderly hypertension patients will increase for practitioners as the US aging population rises. Most ISH in elderly hypertension. Most difficult to treat. Evidence is quite strong for treating ISH. SBP management must come before DBP reduction. Clinical studies demonstrate that lowering SBP lowers cardiovascular and renal disease more than keeping SBP uncontrolled. Prioritizing elderly SBP management is necessary.*

Keywords *— **elderly population, hypertension, modifiable factors, obesity, CRP***

I. INTRODUCTION

Hypertension

WHO, 2013 has depicted that blood pressure is measured in millimetres of mercury (mm Hg) and is recorded as two numbers usually written one above the other. The upper number is the systolic blood pressure the highest pressure in blood vessels and happens when the heart contracts, or beats. Then lower number is the diastolic blood pressure the lowest pressure in blood vessels in between heartbeats when the heart muscle relaxes. Normal adult blood pressure is defined as a systolic blood pressure of 120 mm Hg and a diastolic blood pressure of 80 mm Hg. However, the cardiovascular benefits of normal blood pressure extend to lower systolic (105 mm Hg) and lower diastolic blood pressure levels (60 mm Hg). Hypertension is defined as a systolic blood pressure equal to or above 140 mm Hg and/or diastolic blood pressure equal to or above 90 mm Hg. Normal levels of both systolic and diastolic blood pressure are particularly important for the efficient function of vital organs such as the

heart, brain and kidneys and for overall health and wellbeing [1].

II. EPIDEMIOLOGY OF HYPERTENSION

Global

Anand SS et al., 2011 and WHO, 2012 concluded that as per the World Health Statistics 2012, of the estimated 57million global deaths in 2008, 36 million (63%) were due to non-communicable diseases (NCDs) [2]. The largest proportion of NCD deaths is caused by cardiovascular diseases (48%). In terms of attributable deaths, raised blood pressure is one of the leading behavioral and physiological risk factors to which 13% of global deaths are attributed. Hypertension is reported to be the fourth contributor to premature death in developed countries and the seventh in developing countries. Recent reports indicate that nearly 1 billion adults (more than a quarter of the world's population) had hypertension in 2000, and this is predicted to increase to 1.56 billion by 2025 [3]. Earlier reports also suggest that the prevalence of hypertension is rapidly increasing in developing countries and is one of the leading causes of death and disability. While mean blood pressure has decreased in nearly all high-income countries, it has been stable or increasing in most African countries. Today, mean blood pressure remains very high in many African and some European countries. The prevalence of raised blood pressure in 2008 was highest in the WHO African Region at 36.8% (34.0–39.7). The Global Burden of Diseases; Chronic Disease Risk Factors Collaborating Group has reported 35-year (1980-2005) trends in mean levels of body mass index (BMI), systolic BP and cholesterol in 199 high incomes, middle-income and low-income countries. Mean systolic BP declined in high and middle-income countries but increased in low-income countries and is now more than in high-income countries. The India specific data are similar to the overall trends in low-income countries[4].

National

Health and Family Welfare, Government of India the prevalence of hypertension in the late nineties and early twentieth century varied among different studies in India, ranging from 2-15% in Urban India and 2-8% in Rural India. Review of epidemiological studies suggests that the prevalence of hypertension has increased in both urban and rural subjects and presently is 25% in urban adults and 10-15% among rural adults in a meta-analysis of multiple cardiovascular epidemiological studies, it was reported that prevalence rates of coronary artery disease and stroke have more than trebled in the Indian population [5]. In the INTERHEART and INTERSTROKE study, hypertension accounted for 17.9% and 34.6% of population attributed to various cardiovascular risk factors for coronary artery disease and stroke respectively. As per the Registrar General of India and Million Death Study investigators (2001-2003), CVD was the largest cause of deaths in males (20.3%) as well as females (16.9%) and led to about 2 million deaths annually [5]. Mortality data from CVD in India are also reported by the WHO. The Global Status on Non-communicable Diseases Report (2011) has reported that there were more than 2.5 million deaths from CVD in India in 2008, two-thirds due to coronary artery disease and one-third to stroke. These estimates are significantly greater than those reported by the Registrar General of India and shows that CVD mortality is increasing rapidly in the country. CVD is the largest cause of mortality in all regions of the country. There are large regional differences in cardiovascular mortality in India among both men and women. The mortality is highest in south Indian states, eastern and north eastern states and Punjab in both men and women, while mortality is the lowest in the central Indian states of Rajasthan, Uttar Pradesh and Bihar. The prospective phase of the ongoing Million Deaths Study from 2004-2013 shall provide robust data on regional variations and trends in CVD mortality in India. The prevalence of hypertension in the last six decades has increased from 2% to 25% among urban residents and from 2% to 15% among the rural residents in India. According to Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India, the overall prevalence of hypertension in India by 2020 will be 159.46/1000 population [6]. Various factors might have contributed to this rising trend, attributable to several indicators of economic progress such as increased life expectancy, urbanization and its attendant lifestyle changes including increasing salt intake and the overall epidemiologic transition India

is experiencing currently. Another factor that may contribute is the increased awareness and detection. The prevalence of high normal blood pressure (also called prehypertension in JNC-VII) has been seen in many recent studies and was found to be around 32% in a recent urban study from Central India. In some studies, from South India (Chennai) and from Delhi prevalence of high normal blood pressure has been even higher up to 36% and 44% respectively in these regions. The prevalence of hypertension increases with age in all populations [7].

Teo K et al., 2009 and Gupta R et al., 2008 have documented that in a recent urban study it increased from 13.7% in the 3rd decade to 64% in the 6th decade. In last 2 decades the prevalence of hypertension has been seen to be static in some urban areas. The prevalence of smoking has declined while that of diabetes, metabolic syndrome, hypercholesterolemia, and obesity has been increasing. Teo K et al., 2009 has revealed in his study that hypertension awareness, treatment and control status is low, with only half of the urban and a quarter of the rural hypertensive individuals being aware of its presence. It has been seen that only one in five persons is on treatment and less than 5% are controlled [8]. Gupta R et al., 2008 has shown in his study that rural location is an important determinant of poor hypertension awareness, treatment, and control. It has been said that in India the rule- of-halves is not valid and only a quarter to a third of subjects are aware of hypertension [9].

Isolated Systolic Hypertension

Wilkinson et al., 2000 and Midha et al., 2010 have concluded that Isolated systolic hypertension (ISH) is characterized with raised systolic pressure but normal diastolic pressure, is originally because of aging and, like essential hypertension, benign [10]. However, there is now compelling evidence from cross-sectional, longitudinal, and randomized controlled trials that ISH confers a substantial cardiovascular risk. Chobanian et al., 2003 has depicted that One of the key messages of the Seventh Report of the Joint National Committee (JNC- 7) on prevention, detection, evaluation, and treatment of high blood pressure is that in those older than 50 years, systolic blood pressure greater than 140 mmHg, is a more important cardiovascular disease (CVD) risk factor than diastolic blood pressure [11]. Midha et al. 2010 has concluded in her study that ISH has been identified as an entity since long. It leads to risks of cardiovascular accidents and risk of myocardial infarction (Chou, 1992). Gupta et al. 2006; Midha et al. 2010 has documented that Studies on the prevalence of ISH in developing countries like India are very scanty [12].

Tanu Midha et al., 2010 has suggested that the prevalence of ISH according to JNC-7 criteria was 4.3%, which was 5.1% in men and 3.6% in women. A significant increase in the prevalence of ISH was seen with an increase in age. Multivariate logistic regression analysis of the determinants showed that age, BMI and smoking were significant independent risk factors of ISH [12].

Bruce M et al., 1992 has been already reported in his large cohort study of white men (317,871) 35 to 57 years old at initial screening for possible enrolment into the Multiple Risk Factor Intervention Trial (MRFIT) was examined with regard to initial blood pressure levels and subsequent coronary heart disease (CHD), stroke, and all-cause mortality. The overall prevalence of isolated systolic hypertension (ISH), defined as systolic blood pressure (SBP) greater than or equal to 160 mm Hg and diastolic blood pressure (DBP) less than 90 mm Hg, was 0.67% among white men screened for MRFIT and increased with age (0.31% among 35- to 39-year-olds to 1.7% among 55- to 57-year-olds) [13]. The 6-year CHD and all-cause mortality rates in men over 50 were highest in those with ISH compared with both subjects with diastolic hypertension and those with normal pressure. The relative risk of death from stroke in those with ISH, compared with that in those with SBP less than 160 mm Hg and those with DBP less than 90 mm Hg, was 3.0 (95% confidence interval 1.3 to 6.8). In addition, at any level of DBP, the level of SBP appeared to be the major determinant of all-cause and CHD mortality. The determinants of ISH in individuals under 60 years of age as well as the possible efficacy of its treatment should be evaluated further [14].

Stanley S et al., 2001 previously informed that isolated systolic hypertension was the majority subtype of uncontrolled hypertension in subjects of ages 50 to 59 years, comprised 87% frequency for subjects in the sixth decade of life, and required greater reduction in systolic blood pressure in these

subjects to reach treatment goal compared with subjects in the younger group [15]. Better awareness of this middle-aged and older high-risk group and more aggressive antihypertensive therapy are necessary to address this treatment gap.

Mandal et al., 2012 has depicted in his study that that prevalence of isolated systolic hypertension (ISH) was examined among the Bhotia of Chamoli district, Uttaranchal. Occurrence of ISH was found to be 4.92% among the Bhotia. This prevalence was 2.5% in men and 2.42% in women. The study revealed an increasing trend of occurrence of ISH with increasing age. The determinants like age, abdominal obesity, tobacco chewing and education of the subjects emerged as important risk factors of ISH among the Bhotia of Uttaranchal [16].

Hypertension morbidity and mortality

Gale H et al., 1988 has shown that the large cohort of white men (317,871) 35 to 57 years old at initial screening for possible enrollment into the Multiple Risk Factor Intervention Trial (MRFIT) was examined with regard to initial blood pressure levels and subsequent coronary heart disease (CHD), stroke, and all-cause mortality. The overall prevalence of isolated systolic hypertension (ISH), defined as systolic blood pressure (SBP) greater than or equal to 160 mm Hg and diastolic blood pressure (DBP) less than 90 mm Hg, was 0.67% among white men screened for MRFIT and increased with age (0.31% among 35- to 39-year-olds to 1.7% among 55- to 57-year-olds) [17]. The 6 year CHD and all-cause mortality rates in men over 50 were highest in those with ISH compared with both subjects with diastolic hypertension and those with normal pressure. The relative risk of death from stroke in those with ISH, compared with that in those with SBP less than 160 mm Hg and those with DBP less than 90 mm Hg, was 3.0 (95% confidence interval 1.3 to 6.8). In addition, at any level of DBP, the level of SBP appeared to be the major determinant of all-cause and CHD mortality [14]. The determinants of ISH in individuals under 60 years of age as well as the possible efficacy of its treatment should be evaluated further.

Dahlof et al., 1991 have concluded that antihypertensive treatment in hypertensive men and women aged 70-84 confers highly significant and clinically relevant reductions in cardiovascular morbidity and mortality as well as in total mortality [18].

National High Blood Pressure Education Program., 1994 has concluded that Raised blood pressures in the elderly and the increased prevalence of hypertension in this population are not benign occurrences and should not be viewed as a normal or inevitable consequence of aging. In fact, the relation of systolic and diastolic blood pressures to cardiovascular events is generally more pronounced in people aged 65 years and older when compared with those aged 35 to 64. The relative risk of cardiovascular disease is greater among the elderly at every level of blood pressure. Furthermore, the absolute likelihood that an older individual will have a cardiovascular event is substantially greater than for someone younger, reflecting the increased prevalence of other cardiovascular disease risk factors in this age group. Thus, equivalent blood pressure reduction is likely to produce a greater benefit in the elderly than in younger patients at every level of blood pressure.

Jan A et al., 1999 has demonstrated that in untreated older patients with isolated systolic hypertension, ambulatory systolic BP was a significant predictor of cardiovascular risk over and above conventional BP [19].

Tsogzolmaa D et al., 2009 has concluded that hypertension is a significant contributor to mortality, particularly stroke and CHD mortality, among women in Shanghai. High normal BP is associated with high stroke mortality [20].

Elderly people

Roebuck et al., 1979 has shown that most developed world countries have accepted the chronological age of 65 years as a definition of 'elderly' or older person, but like many westernized concepts, this does not adapt well to the situation in Africa. While this definition is somewhat arbitrary, it is many times associated with the age at which one can begin to receive pension benefits. At the moment, there is no United Nations standard numerical criterion, but the UN agreed cutoff is 60+ years to refer to the older population. Although there are commonly used definitions of old age, there is no general agreement on the age at which a person becomes old. The common use of a calendar age to mark the threshold

of old age assumes equivalence with biological age, yet at the same time, it is generally accepted that these two are not necessarily synonymous[21]. As far back as 1875, in Britain, the Friendly Societies Act, enacted the definition of old age as, "any age after 50", yet pension schemes mostly used age 60 or 65 years for eligibility [22].

WHO, 2015 has documented that the UN has not adopted a standard criterion, but generally uses 60+ years to refer to the older population (personal correspondence, 2001).Realistically, if a definition in Africa is to be developed, it should be either 50 or 55 years of age, but even this is somewhat arbitrary and introduces additional problems of data comparability across nations. The more traditional African definitions of an elder or 'elderly' person correlate with the chronological ages of 50 to 65 years, depending on the setting, the region, and the country. Adding to the difficulty of establishing a definition, actual birth dates are quite often unknown because many individuals in Africa do not have an official record of their birth date. In addition, chronological or "official" definitions of ageing can differ widely from traditional or community definitions of when a person is older. We will follow the lead of the developed worlds, for better or worse, and use the pensionable age limit often used by governments to set a standard for the definition [22].

III. HYPERTENSION AND AGE SPECIFIC RELATION

Mandal et al., 2012 has concluded in his study that there exists a significant association of ISH and age. Prevalence was highest in ≥60 year's age group (21.21%) and lowest in 20-29 years age group (2.23%). Prevalence was 33.19% in 30-39 years age group followed by 6.27% in 40-49 years age group and 8.49% in 50-59 years age group. Thus an increasing trend of prevalence with advancement in age was perceptible.$\chi 2$ = 34.50; Significant (p values <0.05) [23].

Hypertension and Sex Specific Relation

Jane F. Reckelhoff et al., 200 has concluded that Men are at greater risk for cardiovascular and renal disease than are age-matched, premenopausal women. Recent studies using the technique of 24-hour ambulatory blood pressure monitoring have shown that blood pressure is higher in men than in women at similar ages. After menopause, however, blood pressure increases in women to levels even higher than in men [24]. Hormone replacement therapy in most cases does not significantly reduce blood pressure in postmenopausal women, suggesting that the loss of estrogens may not be the only component involved in the higher blood pressure in women after menopause. In contrast, androgens may decrease only slightly, if at all, in postmenopausal women. In this review the possible mechanisms by which androgens may increase blood pressure are discussed. Findings in animal studies show that there is a blunting of the pressure-natriuresis relationship in male spontaneously hypertensive rats and in ovariectomized female spontaneously hypertensive rats treated chronically with testosterone. The key factor in controlling the pressure-natriuresis relationship is the renin-angiotensin system (RAS). The possibility that androgens increase blood pressure via the RAS is explored, and the possibility that the RAS also promotes oxidative stress leading to production of vasoconstrictor substances and reduction in nitric oxide availability is proposed [25].

Priscilla Igho Pemu et al., 2008 has documented that the prevalence of hypertension increases with age across all race and sex groups. Women have lower systolic blood pressure (SBP) levels than men during early adulthood, while the opposite is true after the sixth decade of life [26]. Diastolic blood pressure (DBP) tends to be just marginally lower in women than men regardless of age. Similarly, in early adulthood, hypertension is less common among women than men. However, after the fifth decade of life, the incidence of hypertension increases more rapidly in women; thus, women older than 60 years have higher rates of hypertension compared with men. The highest prevalence rates of hypertension are observed in elderly black women, with hypertension occurring in >75% of black women older than 75 years [27].

Naoki Fujimoto et al., have suggested that elderly hypertensive women may have left ventricular early diastolic dysfunction and higher estimated filling pressure, consistent with their susceptibility to heart failure with preserved ejection fraction (HFpEF). Women with SDH seemed to have more left

ventricular diastolic dysfunction, which might be explained by the greater cumulative afterload when ambulatory [28].

Abiodun M. Adeoye et al., 2014 has depicted that gender and obesity significantly influenced the distribution of the hypertension subtypes. Characterization of hypertension by subtypes in genetic association studies could lead to identification of previously unknown genetic variants involved in the etiology of hypertension. Large-scale studies among various ethnic groups may be needed to confirm these observations.

Hypertension and Weight relation

David W. Harsha et al., 2008 has shown that overweight is an increasingly prevalent condition throughout the world. Current estimates, which are probably conservative, indicate that at least 500 000 000 people worldwide are overweight as defined by a body mass index (BMI) of between 25.0 and 29.9 and an additional 250 000 000 are obese with a BMI of 30.0 or higher. In the United States, recent data indicate that as much as 66% of the adult population is overweight or obese. Overweight and obesity are established risk factors for cardiovascular disease (CVD), stroke, noninsulin dependent diabetes (NIDDM), certain cancers, and numerous other disorders. It is also a risk factor for hypertension [29].

Staessen J et al., 1988 has concluded that in adults of Western societies the positive relationship between blood pressure and body weight has often been demonstrated, both cross-sectionally and longitudinally. This correlation is even stronger in children and early adulthood. In most studies in children, the association between age and blood pressure disappears after controlling for weight. Association must be differentiated from causation. It has however been shown in several intervention studies that treatment of obesity by weight loss decreases blood pressure substantially both in hypertensive and normotensive subjects. Although combining results from several intervention trials is difficult this is the only practical way to get an overall estimate of the hypotensive response to be expected from weight reduction. In the randomized controlled intervention studies, conducted in obese hypertensive patients and reviewed in the present meta-analysis, a decrease in body weight by 1 kg resulted in a reduction of systolic and diastolic pressure by 1.2 and 1.0 mmHg, respectively. Blood pressure generally decreased before normal weight was achieved and remained reduced as long as there was no marked regain in body weight. Although a decrease in salt intake during dieting may contribute to the blood pressure lowering effect of weight reduction, also other mechanisms, such as a reduction in plasma renin activity and a decrease in sympathetic tone may also be involved [30].

Hypertension and body surface area relation.

Ozturk C et al., 2015 has concluded that prevalence of hypertension (HT) is growing among children and adolescents. Its diagnosis is commonly ignored as it does not produce any end-organ damage in adolescents [31, 32]. We evaluated whether the blood pressure (BP) and confounding factors were related to myocardial mass increase; an earlier representative of HT; among adolescents. We have demonstrated that heart rate, body mass index (BMI), left ventricular mass (LVM), interventricular septum, and LV mass indexed to body surface area (BSA) and height significantly increased as the category of BP increased. We have also showed that the systolic BP (SBP), diastolic BP (DBP), and BMI were significantly correlated with the LVM and LVM indexed to BSA and height. Linear regression analysis revealed a significant relationship between SBP, BMI, and LVM, LVM indexed to BSA and height. Hypertension may cause myocardial hypertrophy even at a young age. Height is an alternative and practical way of determining the left ventricular mass index (LVMI) in adolescents. The BMI is significantly related to LVM and LVMI as well as SBP and DBP are. The results support that overweight and obesity should be controlled strictly in the management of HT in a young population [32].

Hypertension and waist circumference relation.

M T Guagnano et al., 2001 has concluded that the waist circumference seems to have a strong association with the risk of hypertension, principally by the ambulatory BP monitoring, when compared with casual BP measurement [33].

Maxime Huot et al., 2011 suggest that abdominally obese individuals are characterized by an elevated SBP response to exercise, irrespective of IR (insulin resistance) and CRF (cardiorespiratory fitness) levels.

The evaluation of exercise BP combined with abdominal obesity could enable the clinician to identify, at an earlier state, individuals at increased risk of cardiovascular events [34].

Cox BD et al., 1998 suggested that for the men, indices involving waist circumference, particularly WHTR (waist: height ratio), had stronger linear associations with the log odds of CVD development than BMI. The interactions with hypertension were significant for WHTR, waist circumference and also body mass index (BMI). In women, none of the indices was linearly associated with the log odds of cardiovascular disease (CVD) development, but there was a significant J-shaped curve for waist circumference and evidence of an interaction with hypertension. These results suggest that studies in which hypertensive are included, but in which possible hypertension interactions are overlooked, important hypertensive-specific associations between anthropometric indices and CVD development may be masked. Men on anti-hypertensive medication with the lowest central adiposity, experienced higher short-term CVD risk than those with greater central adiposity [35].

Ian Janssen et al., 2002 has concluded that The National Institutes of Health cutoff points for WC help to identify those at increased health risk within the normal-weight, overweight, and class I obese BMI categories [36].

IN 1998, the National Heart, Lung, and Blood Institute of the National Institutes of Health (NIH) published evidence-based clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults. These guidelines included a classification system for assessing health risk based on the body mass index (BMI; calculated as weight in kilograms divided by the square of height in meters) and waist circumference (WC). In this classification system, a patient is placed in 1 of 6 BMI categories (underweight, normal-weight, overweight, or class I, II, or III obese) and 1 of 2 WC categories (normal or high). The relative health risk is then graded based on the combined BMI and WC. The health risk increases in a graded fashion when moving from the normal-weight through class III obese BMI categories, and it is assumed that within the normal-weight, overweight, and class I obese BMI categories, patients with high WC values have a greater health risk than patients with normal WC values. This classification system was developed on the basis of the knowledge that an increase in BMI is associated with an increase in health risk, that abdominal or android obesity is a greater risk factor than lower-body or gynoid obesity, and that the WC is an index of abdominal fat content [37].

Mandal et al., 2012 demonstrated the Abdominal obesity was assessed measuring waist circumference of the subjects (Men >102 cm; women > 88 cm). It reveals from Table 2 that prevalence of ISH was much higher among the subjects with abdominal obesity (10.45%) than that of the subjects without abdominal obesity (4.62%). A significant association is found between ISH and abdominal obesity.$\chi 2$ = 4.60; Significant (p values <0.05)[10].

Hypertension and religion relation.

Gupta R et al., 2002 aims to determine the prevalence of certain socio-economic and biological coronary risk factors in urban communities and to compare the findings found in the Hindus and the Muslims. The study employed a cross-sectional survey design and stratified random sampling technique consisting of 1,415 males and 797 females. Among males there were 1,092 Hindus (77.2%) and 272 Muslims (19.2%) while in females there were 685 Hindus (85.9%) and 91 Muslims (11.4%). Prevalence of illiteracy and sedentary lifestyle were significantly more in Muslims. Smoking or tobacco use in males was similar but in females it was more in the Hindus. Self-reported diabetes was found in 1.4% Hindu males and in 1.2% Hindu females. No Muslim reported diabetes. Hindu males were significantly taller than Muslims. In both males and females there was no significant difference in body mass index and obesity. In Hindu males the diastolic BP was significantly greater than in Muslims prevalence of hypertension (30.5% versus 25.7%) was also significantly more. In Hindu females the mean systolic BP was significantly more and there was also difference in hypertension prevalence (35.2% versus 25.3%). CHD prevalence was significantly greater in Hindu males as compared to the Muslims when determined by the presence of either ECG changes alone (4.3% versus 0.7%; p = 0.008) or ECG changes combined with clinical history (7.1% versus 1.8%; p = 0.002). A similar, though not significant, trend was

seen in females (ECG changes: 8.9% versus 6.6%, clinical and ECG changes: 10.4% versus 6.6%). The prevalence of CHD is significantly more in Hindu males as compared to the Muslims and is associated with a greater prevalence of diabetes and hypertension [38].

Emily D. Williams et al., 2010 suggested that Muslims were exposed to more psychosocial and behavioral adversity than Sikhs and Hindus, and highlights the importance of investigating subgroup heterogeneity in South Asian CHD risk [39].

Hypertension and education relation.

Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure., 1993 has documented that Inadequate functional health literacy poses a major barrier to educating patients with chronic diseases, and current efforts to overcome this appear unsuccessful. Chronic diseases such as hypertension and diabetes require patient education to achieve adequate control and prevent adverse health outcomes. American Association of Diabetes Educators1995 has concluded that patients with hypertension may need to understand how to properly take multiple medications and modify their lifestyle (eg, low salt diet, weight loss, or exercise) to achieve adequate blood pressure control. The intricacies of the diabetic diet, insulin injection, and home glucose level monitoring place even greater educational requirements on patients. Grueninger UJ et al., 1995 has concluded that patient education also plays a critical role in facilitating patients acceptance of their diagnosis and understanding behavioral changes required for active participation in treatment [40].

Leichter et al., 1981,Boyd MCitro et al., 1983,Meade CByrd et al.,1989,Davis T et al., 1990,Dixon E et al.,1990 have concluded that traditional patient education relies heavily on written material about disease processes, medical management, and self-care instructions. Despite the availability of extensive health education materials with relatively consistent content, many are written at too high a level for low-literate patients to comprehend essential points [41]. Mulrow C et al., 1987 and Dunn S et al.,1990 has supported the above line in their study and concluded that, patients with inadequate literacy may not benefit from such educational efforts. This may explain why some patient education programs have been unsuccessful [42].

Williams M et al., 1995 has stated that this problem may be more common than many health care providers realize; reading skills are deficient in 46% to 51% of adult US citizens according to the National Adult Literacy Survey[43]. We previously documented that 35.1% of English-speaking patients and 61.7% of Spanish-speaking patients seeking care at2 public hospitals lack literacy skills adequate to function in the health care settings. Baker D et al., 1997 and Weiss B 1992 have documented that people with lower literacy skills also correlate with poorer self-reported health status. Because of their worse health, patients with poor literacy skills are likely to have even greater educational needs. However, the impact of literacy on patients' knowledge of their own illnesses and self-management skills has not been elucidated [41].

Doris Samal et al., 2007 suggested that knowledge in our population was insufficient and partly associated with educational level, leaving much room for improvement by educational campaigns. Furthermore, we found a gap between knowledge of the increased risk for stroke in patients with hypertension and awareness of their own risk [44].

Christianne L et al., 2006 has shown in his study that the effectiveness of adding patient education to provider education in improving blood pressure control among veterans with uncontrolled essential hypertension. Previous studies found that a strategy of provider education alone led to inconsistent results or minimal change in provider behavior Therefore, he used provider education only as the control group for his study. Patients in all 3 intervention groups had clinically significant and clinically meaningful reductions in systolic blood pressure. Those receiving patient education had an additional important reduction in blood pressure. The additional 6–mm Hg reduction in blood pressure in the provider education, alert, and patient education group has the potential to reduce cerebrovascular morbidity and mortality by 42%, coronary heart disease by 14%, and heart failure by 50% [45].

Mandal et al., 2012 has revealed in table 3 the significant association between occurrence of ISH and educational status of the subjects. Occurrence of ISH was highest among the illiterate (7.71%), whereas it was minimum among the high school and above level educated individuals. However, it is interesting to note that occurrence was more among the high school educated individuals (5.38%) than that of the primary level educated individuals (4.04%).$\chi 2 = 10.06$; Significant (p values <0.05)

Doris Samal et al., 2007 has revealed that knowledge in our population was insufficient and partly associated with educational level, leaving much room for improvement by educational campaigns. Furthermore, we found a gap between knowledge of the increased risk for stroke in patients with hypertension and awareness of their own risk [44].

Hypertension and dietary habits relation.

Veg/Non- veg

Several dietary constituents including sodium [46]total calories [47] saturated fat and alcohol have been shown to be positively related to blood pressure (BP). Potassium, calcium, magnesium, polyunsaturated fat and fiber appear to be inversely related to BP. The vegetarian diet tends to be low in the factors positively related to BP, and high in the protective factors (except for calcium in the diet of strict vegetarians who consume no dairy products) [48]. Cross sectional studies of White adults in Australia, Israel, and the United States have found lower BP among vegetarians than nonvegetarians. Estimates from these studies of the magnitude of the blood pressure differences attributable to diet may be inaccurate because of the lack of random selection of subjects, and group differences in the use of alcohol, caffeine, and tobacco; physical activity; psychosocial stress; weight body mass index (BMI) or anatomic location of body fat [49]. Despite the shortcomings of these observational studies, several experimental studies have been conducted which demonstrate a modest BP lowering effect when omnivores are switched to a vegetarian diet in these trials a placebo effect cannot be excluded since subjects were not blind to the type of diet consumed. Whether the vegetarian diet protects against elevated BP has not been studied in US Black adults, a population with a high prevalence of hypertension, possibly due to genetic susceptibility. Christopher L et al., 1989 compared BP in a group of Black adults following a vegetarian diet to that of a group of Black non-vegetarians. Christopher L et al., 1989 also explored the possible interaction of dietary preference and race by examining BP in a sample of White vegetarians and non-vegetarians. To reduce the confounding effects of alcohol, caffeine, and tobacco, Christopher L et al., 1989 studied members of the Seventh Day Adventist Church which encourages avoidance of these substances [49].

Roland L et al., 1978 has concluded in their study that Vegetarian/non-vegetarian status is strongly related to risk of CHD death in Seventh-Day Adventists (SDA) males below age 65. It is likely that other CHD risk factors only partially account for this relationship. Vegetarian/non-vegetarian status shows little or no relationship to risk of CHD death in males over age 65 and females of any age. Evidence suggests that pure-vegetarian females have an increased risk of CHD death. The lower CHD risk among young SDA males may be a result of lower total or saturated fat intake or higher intake of dietary fiber. Tripathi et al., 2010 has concluded in their study that the type of diet consumed by human being play an important role in the prevention of hypertension and cardiac diseases. The aim of our present study was to reveal the difference in BMI, blood pressure, calorie intake (carbohydrate, protein), dietary electrolyte pattern, serum sodium and chloride in vegetarian and non-vegetarian group from hill and plain. We investigated the serum and urinary profile (Na+ and Cl-) of 400 healthy vegetarian and non-vegetarian subjects from two different geographical regions, and compared it with their daily dietary intake (carbohydrate, protein, sodium, chloride) and various anthropometric measures (BMI, blood pressure). The non-vegetarian subjects from the plain region have higher calorie intake rather than hill region, which reflected in the form of increased BMI and blood pressure. The Serum and urinary profile of Na+ and Cl- were higher in non-vegetarian subjects from plain region and showed higher blood pressure as compared to the hill subjects. We can conclude from the study that vegetarian diet may have preventive role in hypertension and the hill subjects have lesser chance

of hypertension due to healthy work culture and better adaptability in sodium excretion [50].

Junk food

Hopping BN et al., 2010 has documented that In Saudi Arabia there is increasing trend of junk food use. Combined with sedentary lifestyle, high prevalence of obesity, diabetes mellitus, hypertension and coronary heart disease, it is detrimental to health and will aggravate existing lifestyle diseases in the country. People here eat more consuming more quantity with less quality.

Cizza G et al., 2011 has depicted that junk food, fast food and trash food are all definitions of a quick, unhealthy, hunger satisfying food, which are easy to make and easy to consume. They are low in nutritional value with a high caloric value. The term 'Junk food' was coined by Michael Jacobson, director of Center for Science in 1972. Junk food contains high level of refined sugar, white flour, polyunsaturated fats, salts and numerous food additives but lacking in protein, vitamin and fibers. Junk food is popular because of their simplicity of manufacture, consumption and good taste. Cheah WL et al., 2011 has documented that Junk foods have high amount of saturated fats. Fats cause people to put on weight and being overweight is a risk to heart and causes other disease as obesity and diabetes. Junk food often has too much salt which may make hypertension worse. Junk food addiction is high as it's easy to prepare and are tasty [51].

Moloud et al 2015 have found that junk food consumption increased the risk of both general and abdominal obesity; therefore, consumption of junk food should be reduced via restricting TV advertisements and increasing taxes on junk foods. In recent decades, childhood obesity has become a worldwide concern. In the United States, nearly one third of children and adolescents are overweight or obese. In addition, the prevalence of obesity in children in developing countries, including Iran, is increasing rapidly. In the third nationwide survey of the CASPIAN study, 1 7.7% of the students were overweight or obese (1 9.9% of boys and 1 5.5% of girls). Abdominal obesity also has been reported (1 6.3%). In addition, in childhood, obesity is a known risk factor for cardiovascular disease (including hypertension and coronary disease), type-2 diabetes, and certain types of cancer. Obese children are at increased risk of mortality and morbidity resulting from cardiovascular disease in adulthood. Increased sedentary activity, lack of regular physical activity, and poor eating habits, e.g., high intake of sweetened beverages, fast foods, and sweets, may lead to obesity. Only 25% of hypertensive cases are diagnosed and treated. Many studies have shown that hypertension may begin in adolescence or even in childhood. In children, the prevalence of hypertension is lower than adults. The prevalence of hypertension in the adult population of the United States and Europe has been estimated at 1 5-30%, while the prevalence in children is 3-5 Physical inactivity, smoking, consumption of fast food, and sugar-sweetened beverages are associated with increased blood pressure. Low intake of nutrients and increased consumption of high-energy foods is known as junk food. It represents a significant proportion (1 5-40%) of total daily caloric intake of children and has been shown to be associated with overweight and obesity. These eating habits of children and adolescents are a concern of many researchers. A study has shown that increased consumption of snacks is associated with obesity and other chronic diseases among children and adolescents. The consumption of junk food as snacks is increasing among children. The prevalence of obesity has increased with a greater intake of processed carbohydrates (e.g. sugar, white flour, and saturated fats) in Western societies during past century [52]. Majane et al. have demonstrated that consumption of a diet high in sugar and saturated fat compared to sugar-free and low-fat diet resulted in left ventricular dysfunction and hypertension[51]. Experimental studies have shown that chronic hypertension and systolic and diastolic dysfunction can lead to heart failure. As a result of changing dietary patterns in recent decades, nutritious snacks are substituted by junk food. Television advertising, attractive packaging, and lack of parental awareness are the major cause of junk food consumption. These snacks contain high amounts of fat, salt, and sugar. Excess salt intake in childhood is associated with hypertension in adulthood. Since lifestyle changes, weight disorders, and hypertension prevalence have increased rapidly due to epidemiological and nutritional transition in recent years in Iran, and

because the effect of junk food consumption on these disorders in children and adolescents is not well documented, this study was designed to evaluate association between hypertension and obesity with junk food consumption in a representative national sample of Indian elderly population.

Smoking/SLT & Tobacco relation with Hypertension

Mandal et al., 2012 has shown that occurrence of ISH was found to be comparatively higher among the Bhotias who smoke regularly (5.42%) than that of individuals who do not smoke (3.31%). Association of smoking habit with ISH prevalence was found to be non-significant. $\chi 2 = 2.20$; Not significant. Frequency of ISH was found to be higher among the individual with tobacco chewing habit (7.75%) than that of the individual without tobacco chewing habit (4.17%). In application of Chi^2 statistical significant difference was found in case of this determinant. $\chi 2 = 5.85$; Significant (p values <0.05) [53, 54]

Hypertension and menopausal women relation

Karen A et al., 1989 have shown in their research that women who had a natural menopause and did not receive hormone-replacement therapy, serum levels of high-density lipoprotein (HDL) cholesterol declined as compared with those of premenopausal controls and levels of low density lipoprotein (LDL) cholesterol increased. In menopausal women who received hormone-replacement therapy, HDL and LDL cholesterol levels did not change, but the levels of triglycerides ,Apo lipoprotein A-I and Apo lipoprotein A-II increased as compared with premenopausal controls. Natural menopause did not affect blood pressure, plasma glucose or insulin levels, body weight, the total number of kilojoules consumed in the diet, or the total number of kilojoules expended in physical activity.

On the basis of the research Karen A et al., 1989 suggest that a natural menopause has an unfavorable effect on lipid metabolism, which may contribute to an increase in the risk of coronary disease. Hormone-replacement therapy may prevent some of these changes [55].

The SIMONA study (Study on Hypertension Prevalence in Menopause in the Italian population) was a large cross-sectional study on 18 326 women of age range 46–59 years, consecutively seen by 302 practitioners all over Italy, and representing 60% of the women of that age in the National Health care list of those doctors. BP was measured three times in the seated position by the same automatic machine, and demographic and clinical data were taken. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were slightly but significantly higher in postmenopausal than pre-menopausal and post-menopausal women, but so were age and BMI. Within seven biannual strata, differences in age and BMI were minimized, but SBP/DBP remained significantly higher (by 3.4/3.1 mmHg) in postmenopausal than in premenopausal subjects in the youngest stratum (46–47 years), and was also significantly higher in the stratum 48–49 years [56]. The differences remained significant after the exclusion of 1809 women with surgical menopause or 695 women with cardiovascular disease. Even when the confounding effects of age, BMI, smoking and contraceptive or replacement therapies were excluded by analysis of covariance, menopause was significantly and positively associated with SBP and DBP (approximately 2 mmHg difference in the age range 46–49 years). On the basis of the research Zanchetti et al., 2005 have concluded that Menopause is associated with a slightly but significantly higher BP, even after adjustment for age and BMI, as well as other confounding factors, but the association is evident only in the younger end of the age range related to menopause [56].

Denis Nash et al., 2003 has concluded that at levels well below the current US occupational exposure limit guidelines (40 µg/dL), blood lead level is positively associated with both systolic and diastolic blood pressure and risks of both systolic and diastolic hypertension among women aged 40 to 59 years. The relationship between blood lead level and systolic and diastolic hypertension is most pronounced in postmenopausal women. These results provide support for continued efforts to reduce lead levels in the general population, especially women [57].

Deborah Grady et al., 1992 has depicted that hormone therapy should probably be recommended for women who have had a hysterectomy and for those with coronary heart disease or at high risk for coronary heart disease. For other women, the best course of action is unclear [58].

Associated comorbid conditions with hypertension

Long AN et al., 2011 has concluded that up to 75% of adults with diabetes also have hypertension, and patients with hypertension alone often show evidence of insulin resistance. Thus, hypertension and diabetes are common, intertwined conditions that share a significant overlap in underlying risk factors (including ethnicity, familial, dyslipidemia, and lifestyle determinants) and complications [59].

Evelyn P et al., 2008 has concluded that essential hypertension (EHT) tends to coexist with other conditions and the most common secondary diagnoses included diabetes, abnormal lipid metabolism, hypokalemia, and anemia. Whereas diabetes without complication was the most common comorbidity of unspecified (10.7%) and malignant (12.6%) hypertensive patients, abnormal lipid metabolism was the most common co-morbidity of benign (20.0%) hypertensive patients. The most frequent symptom in all three groups was headache. About 60.0% (malignant), 34.6% (unspecified), and 4.2% (benign) of patients' main reason for ED visit were not related to their principal diagnosis. Variation in factors contributing to comorbidities between three types of EHT should be further explored [60].

Tykarski A et al., 2005 has concluded that hypertension is a chronic, often asymptomatic disease that affects nearly 30% of adults in Poland. The primary goal in hypertension treatment is to reduce long-term cardiovascular risk. However, recent studies have focused on the health-related quality of life (HRQoL) in hypertensive patients to improve daily functioning, minimize physical and psychological suffering, and enable full participation in family and social life. The HRQoL of hypertensive patients is worse than that of healthy individuals and is dependent on blood pressure, organ damage, comorbidities (including obesity), and treatment (both pharmacological and non-pharmacological. As in the general population, lower HRQoL values in hypertensive patients are associated with older age, female sex, low socioeconomic status, and lower educational level [61]. Comorbidities in hypertensive patients have been observed to reduce the effect of therapy and to decrease the HRQoL. These concurrent diseases can be divided into 3 groups: conditions causally related to hypertension (overweight and obesity, diabetes, hyperthyroidism, chronic glomerulopathies), complications of hypertension (atherosclerosis, ischemic heart disease, myocardial infarction, heart failure, stroke), and conditions unrelated to hypertension (degenerative disc disease, neurotic disorders, chronic obstructive pulmonary disease [COPD] and asthma, peptic ulcer disease. A number of studies have suggested that the presence of complications and comorbidities influences the HRQoL in hypertensive patients more than hypertension itselfAlthough the effect of comorbidities on the HRQoL in hypertensive patients is becoming apparent, few studies have investigated this relationship in detail [62].

IV. LAB INVESTIGATIONS

Creatinine & Urea

J. hunter young et al., 2002 has concluded that the association between BP and decline in kidney function in older persons and the BP component most responsible for kidney disease are unknown. This study investigated the relationship between baseline BP and an incident decline in kidney function among 2181 men and women enrolled in the placebo arm of the Systolic Hypertension in the Elderly Program (SHEP). A decline in kidney function was defined as an increase in serum Creatinine equal to or greater than 0.4 mg/dl over 5 yr of follow-up. The incidence and relative risk of a decline in kidney function increased at higher levels of BP for all BP components, independent of age, gender, ethnicity, smoking, diabetes, and history of cardiovascular disease. Systolic BP imparted the highest risk of decline in kidney function. Systolic BP is a strong, independent predictor of a decline in kidney function among older persons with isolated systolic hypertension. Systolic BP, pulse pressure, and mean arterial BP are predictors of decline in kidney function among older persons with isolated systolic hypertension. Adjusting for other factors minimally affected these relationships. Of these measures, systolic BP has the greatest ability to predict a decline in kidney function. In addition, this association persisted in a group with very low likelihood of baseline kidney dysfunction and in high-risk groups, i.e., diabetic patients and African Americans. The risk associated with systolic BP was

somewhat greater in these high-risk groups, but there was no statistically significant interaction [63].

WBC (TLC count)

Links between inflammation and hypertension have been suggested in the past; with mounting evidence of more than a mere putative link between the two, with implications in the development of complications and the management of hypertension per se (Boos CJ et al., 2005, Bautista LE et al., 2003).Various inflammatory markers including high-sensitive C-reactive protein (hsCRP), interleukin-6 (IL-6), tumor necrosis factor alpha (TNF- a) and white blood cell (WBC) count have been studied and found to be associated with hypertension and its complications [64]. Certainly, there has been an enormous interest in the identification of these measurable indices even in persons at risk of, but without overt hypertension or complicating cardiovascular disorders. However, most of these studies have been cross-sectional in design, making it difficult to understand whether inflammation, chronic or mild, with an increase in the inflammatory markers, is a cause or an effect of high blood pressure [65]With respect to the relationship between WBC count and hypertension, one population-based study found an association between elevated WBC count and incident hypertension in a predominantly white population, with the risk ratio of hypertension being directly related in a dose-dependent manner to increasing tertiles of WBC count (WBC count tertiles 1–3 has relative risks (RR) of hypertension. This association appeared to be independent of smoking and other cardiovascular risk factors. Two longitudinal studies investigating the association between WBC count and incidence of hypertension noted an increased incidence of hypertension with 'high normal' WBC count compared to lower WBC counts [66]. Again both these studies involved a predominantly white population, with small numbers of Afrom Caribbeans. In this issue of the Journal of Human Hypertension. Add further weight to data on the relationship between WBC count and rising systolic blood pressure (SBP) within the normotensive range. In this cross-sectional study, blood pressures and WBC counts were measured in 3484 white asymptomatic low-risk subjects (mean age 43 years, predominantly males) attending a primary prevention clinic, after assessments for cardiovascular risk factors. A linear relationship between elevated WBC count and higher SBP was found, with particularly high WBC count among subjects with SBP 130–139 mmHg when compared to those with SBP o 120 mmHg (P ¼ 0.02) [67]. This study involved a predominantly white Brazilian population, and again, the relationship in nonwhite subjects remains unclear. Is the association of WBC count with hypertension plausible? It has been hypothesized that elevated WBC counts cause a chronic low-grade inflammation that alters endothelial function, affecting nitric oxide and prostacyclin production and consequently, a loss of vasodilator, antithrombotic and anti-atherogenic properties of the vascular endothelium. Other postulated mechanisms include increased adherence of the stimulated leukocytes to the vascular endothelium, causing capillary leucocytosis and subsequent increased vascular resistance; a raised WBC count may therefore indicate increased catecholamine levels or enhanced sympathetic nervous system activity, thus causing an increase in blood pressure and eventually resulting in sustained hypertension. In addition, inflammation may play a key role in the initiation and development of hypertension via the pro-inflammatory actions of mediators such as adhesion molecules, chemokines, growth factors, heat shock proteins, endothelin-1 and angiotensin. Certainly, a persistent low-grade inflammatory state could result in high normal levels of inflammatory cytokines.

In view of a predominantly thrombotic nature of the complications of hypertension, various rheological and homeostatic factors have been hypothesized to play a role in the pathogenesis of hypertension and cardiovascular disease [68]. Whether high WBC counts have any role in the complex rheological abnormalities (including whole blood and plasma viscosity, von Wille brand factor, platelet activation and aggregation, fibrinogen,etc.) Seen in hypertension remains to be determined.

K^+/Na^+/Ca^{++}/cl- relation with hypertension

HUGO K et al., 1988 has demonstrated during an epidemiological survey on the relationship between diet and cardiovascular risk factors, serum sodium, potassium, calcium, phosphorus, and total protein were measured in 4167 men and 3891 women with a mean age of 49 years. Several consistent and highly

significant correlations were found between serum cation and phosphorus levels and blood pressure. The analysis was performed separately in the total group and in the group not receiving treatment for hypertension [69]. A highly significant negative correlation existed between serum sodium and both systolic and diastolic blood pressure. Serum potassium correlated negatively with blood pressure only in men. Serum phosphorus correlated negatively hi men and women with systolic blood pressure. Serum calcium correlated positively with systolic and diastolic blood pressure hi men, but only with diastolic blood pressure hi women. All these correlations were independent of serum total protein. A significant negative correlation between serum phosphorus and heart rate and a significant positive correlation between the serum calcium/phosphorus ratio and heart rate were demonstrated· Both serum calcium and phosphorus levels are influenced by the parathyroid hormone, which increases the serum calcium level and decreases the serum phosphorus level. A decreased serum phosphorus level exists in spontaneous hypertensive rats, Bloomquist El et al., 1983 and dietary phosphate administration lowers their blood pressure. The role of the parathyroid gland in hypertension is now the focus of several studies [70]. The renin profile could also affect the relationship between calcium and blood pressure. Interesting and unexpected findings were the significant negative relationship between serum phosphorus and heart rate and the significant positive one between the serum calcium/phosphorus ratio and heart rate. The level of significance and the fact that the relationship was present in all subgroups examined make it highly improbable that this was a chance finding. Heart rate correlates positively with blood pressure in epidemiological studies.

Food and its component play an important role in regulation of salt and electrolyte profile of individuals, which may be one of the important regulation factors in the prevention of hypertension and its related morbidity. The vegetarian diets are rich in carbohydrate whereas non-vegetarian diets are protein rich. The different type's food habits are also responsible for difference in electrolyte profile that can lead to hypertension [71]. Hypertension has been described as a silent "killer" that accelerates another killer atherosclerosis. There has been a world-wide concern about prevention of this disease by dietary alterations. Currently there is an increasing scientific interest in vegetarian diets in the prevention of several diseases. It is reported that the vegetarian populations have lower blood pressure, serum and urinary sodium, chloride and body weight than non-vegetarian, but there is a strong possibility that effect of diet may be confounded by other lifestyle factors. Some studies showed the influence of vegetarian diet and lifestyle factors in hypertension and cardiovascular disease. There is scientific evidence that links the effect of dietary sodium consumption on hypertension. Many investigators have highlighted the potential relations of serum (or plasma) sodium concentrations to high blood pressure. Wardener and colleagues have suggested that higher serum sodium levels may be a marker of higher blood pressure (BP). The serum chloride value is also an important electrolyte component in regulation of hypertension. There are some studies indicating the relation of Cl anion metabolism to blood pressure[72]. The low concentration of serum chloride decreases excretion of sodium & chloride in the urine. All these studies in relation to the blood pressure differences, which are attributable to diet, may not be accurate because of the lack of random selection of subjects. In spite of the shortcomings of these observational studies, several experimental studies have been conducted, which demonstrate modest BP lowering effects when non-vegetarian were switched over to a vegetarian diet.

Data from a representative sample of the U.S. adult population obtained during 1971-1975 were analyzed to provide a profile of blood pressure (BP) levels and related nutritional and socio-demographic factors [73]. Older adults (aged 55-74 years) had a twofold greater prevalence of high BP than younger adults (25-54 years), and older black persons had the highest rates. Isolated systolic elevation was uncommon under 54 years of age, but occurred in 5% to 10% of adults over 55 years and was less common than systolic-diastolic elevation. In older adults, body mass (weight/height2) had the strongest relationship to BP of all the nutritional variables. Alcohol consumption and dietary calcium and phosphorus were associated with high BP, but

dietary sodium and salt use were not. The serum calcium/phosphorus ratio and serum urate were significantly higher in older adults with high BP. In general, the variables associated with elevated BP in older adults were similar to those in younger adults, although the strengths of the associations differed [74].

Alanine Amino Transferase

Beevers et al., 2003 has concluded in his research that liver-function data were compared in 158 unselected hypertensive and 105 normotensives aged 45-64 years [75]. Serum concentrations of alanine and aspartate aminotransferase (S.G.O.T. and S.G.P.T.) were higher, and more often raised, in the hypertensive patients. Serum bilirubin and alkaline phosphatase concentrations were similar in both groups. In hypertensive patients aminotransferase concentrations tended to be higher in those with increased alcohol intake.

Low Density Lipoprotein (LDL) & High Density Lipoprotein HDL

Hypertension and hypercholesterolemia each predispose to coronary heart disease, but the two acting in concert alter risk substantially because their combined effects are considered to be multiplicative rather than additive. (Report of Inter-Society Commission for Heart Disease Persons with a combination of risk factors are, therefore, at particularly high risk of coronary heart disease. Hypertensive subjects frequently have higher cholesterol levels than do normotensive subjects. A positive relation between serum cholesterol level and blood pressure has been reported in many epidemiological studies but the results have often been inconsistent across population subgroups, and some investigators consider the association to be of little biological importance [76]. Recent experiments indicate that impaired endothelium-dependent vascular relaxation in patients with essential hypertension may be associated with hypercholesterolemia [77]and it has been suggested that low density lipoprotein (LDL) cholesterol in itself may be a modifiable risk factor for hypertension. Also, heightened sympathetic activity or peripheral insulin resistance may be related to hyperlipidaemia in hypertension. Few attempts have been made to analyse the relation between blood pressure and serum lipid levels or to assess the determinants within a population for this association. A better understanding of the interrelation between blood pressure and blood lipid levels may be of relevance for the understanding of how essential hypertension is related to the etiology and pathogenesis of arteriosclerosis and, thereby, also for selecting the appropriate therapeutic approach.

C-Reactive Protein (CRP)

High blood pressure (HBP) is one of the most important risk factors for cardiovascular–renal disease. Despite its high health impact, primary prevention of HBP is partly hampered because of a limited knowledge of HBP risk factors. Several prospective cohort studies have shown that acute systemic inflammation is associated with an increased risk of acute cardiovascular events and cardiovascular mortality. Recently published data also suggest that chronic inflammation could be an independent risk factor for HBP. C-reactive protein has been shown to be associated to HBP in a few well controlled studies. On the other hand, results from studies on the association between interleukin-6 (IL-6) and HBP have been contradictory. Similarly, some studies in human subjects have shown a positive association between tumour necrosis factor alpha (TNF- a) level and HBP (but others have not. However, most of these studies were not designed to test the association between inflammation markers and HBP and have failed to control for other risk factors for HBP and for other inflammatory markers. Since Creactive protein (CRP) production by hepatocytes is regulated by cytokines, mostly IL-6 and TNF- a, [78] it is unlikely that any one inflammatory marker will fully reflect the complexity of mild chronic inflammation and capture its relationship with HBP. Moreover, the effect of one cytokine on HBP may be confounded or interact with the effects of the other cytokines, a problem that has not been addressed in previous studies. In this article, we report the independent effects of CRP, TNF- a, and IL-6 on blood pressure (BP) in a random sample of free-living healthy subjects.

CRPs are acute-phase proteins produced by the liver and are elevated when there is tissue injury, infection, or inflammation. CRPs are prothrombotic

and promote tissue factor production, macrophage uptake of low-density lipoprotein, vascular cell adhesion molecule expression and induce monocyte chemo-attractant protein. Elevated levels of hs-CRP are associated with an increased risk of recurrent events in all of the acute coronary syndromes. Various inflammatory markers including high-sensitive C-reactive protein (hsCRP), interleukin-6 (IL-6), tumor necrosis factor alpha (TNF- a) and white blood cell (WBC) count have been studied and found to be associated with hypertension and its complications [64].

Visceral Adiposity Index (VAI)

Amato MC et al., 2014 depicted that the VAI, among the most common indexes of adiposity assessment, shows the best correlation with the best known adipocytokines and cardiometabolic risk serum markers, the VAI would be an easy tool for clearly mirroring a condition of cardiometabolic risk [79].

$$\text{Females}: VAI = \left(\frac{WC}{36.58 + (1.89 \times BMI)}\right) \times \left(\frac{TG}{0.81}\right) \times \left(\frac{1.52}{HDL}\right)$$

$$\text{Males}: VAI = \left(\frac{WC}{39.68 + (1.88 \times BMI)}\right) \times \left(\frac{TG}{1.03}\right) \times \left(\frac{1.31}{HDL}\right)$$

The VAI was calculated as described (Amato MC et al., 2010, Zhang X et al., 2013) using the following sex-specific equation, where TG is triglyceride levels expressed in mmol/l and HDL is HDL cholesterol levels expressed in mmol/l.Visceral adiposity is generally considered to play a key role in the metabolic syndrome, including hypertension. Greater visceral adiposity increases the odds of hypertension in Japanese Americans independent of other adipose depots and fasting plasma insulin. At the turn of the Second World War, Jean Vague, a French physician, had made a simple but important observation: android obesity (truncal obesity) was often associated with diabetes mellitus and CVD. Since then, our understanding of the extraordinary complex links among visceral adipose tissue, inflammation, hypertension, and cardiovascular disorders has been extended up to the molecular level. Unfortunately, meanwhile, the mosaic of modifiable risk factors has changed at a startling pace in Westernized societies and now in developing countries, where obesity is considered by many authorities as the major public health problem. Then, it should be recognized that, in light of the havoc brought about by visceral obesity, a concerted approach to prevent and to treat afflicted patients is urgently needed. Hopefully more research will lead in the near future to widely applicable lifestyle intervention programs and/or to the discovery of new pharmacological targets to prevent or alter the course of CVD in viscerally obese patients. Mohammadreza B et al., 2010 has documented that risk of future CVD increased with increasing levels of VAI among both men and women [80]. VAI was associated with multivariate-adjusted increased risk of incident CVD among women.

Body Mass Index (BMI)

BMI is calculated the same way for both adults and children. The calculation is based on the following formulas:

Formula: weight (kg) / [height (m)]^2 With the metric system, the formula for BMI is weight in kilograms divided by height in meters squared. Since height is commonly measured in centimeters, divide height in centimeters by 100 to obtain height in meters. Example: Weight = 68 kg, Height = 165 cm (1.65 m)^2 Calculation: 68 ÷ (1.65)^2 = 24.98 (www.cdc.gov/healthyweight/assessing/bmi)

The current WHO BMI cut-off points of <16 kg/m 2 (severe underweight), 16·0–16·9 kg/m 2 (moderate underweight), 17·0–18·49 kg/m 2 (mild underweight), 18·5–24·9 kg/m 2 (normal range), 25 (overweight), 25–29·9 kg/m 2 (pre-obese), 30 kg/m 2 (obesity). 30–39·9 kg/m 2 (obese class I), 35–39·9 kg/m 2 (obese class II), 40 kg/m^2 (obese class III) should be retained as international classification. But the cut-off points of 23, 27·5, 32·5, and 37·5 kg/m^2 are to be added as points for public health action. For many Asian populations, additional trigger points for public health action were identified as 23 kg/m^2 or higher, representing increased risk, and 27·5 kg/m ^{2} or higher as representing high risk. The suggested categories are as follows: less than 18·5 kg/m^2 underweight; 18·5–23 kg/m 2 increasing but acceptable risk; 23–27·5 kg/m 2 increased risk; and 27·5 kg/m^2 or higher high risk. (WHO expert consultation*)

Mandal et al., 2012 has repoerted in their research that prevalence of ISH was found to be highest

among the obese individual (14.28%), whereas this prevalence was 4.68% among the normal weight and 4.85% among the overweight (BMI: 25-29.9) individuals. However, no such association is found in application of chi$^{2.}$ $\chi 2 = 5.38$; Not significant

Glomerular Filtration Rate (GFR)

Soren N et al., 1993 has concluded that T2DM patients neither normoalbuminuria nor microalbuminuria are at an average associated with an accelerated decline in kidney function. Still, systolic blood pressure is a determining factor for the rate of decline in the glomerular filtration rate. A longer follow-up time with consecutive glomerular filtration rate measurements are needed to determine the long-term implications of normoalbuminuria and microalbuminuria on kidney function in T2DM [81].

Non-Pharmacological Treatments

Lifestyles Modifications

Lifestyle modifications can help prevents or delay the onset of hypertension and reduce blood pressure in already hypertensive patients. The JNC 7 recommendations are fairly universal to good health practices—maintain a normal body weight, do not smoke, exercise, etc. In addition to preventing or reducing high blood pressure, these modifications reduce the risk of other cardiovascular diseases. Weight Reduction Maintaining a normal body mass index (18.5-24.9 kg/m2) helps control blood pressure. In fact, SBP can be reduced between 5-10 mm Hg for every 10 kg of body weight that is lost [82].

Diet

The Dietary Approaches to Stop Hypertension (DASH) diet is a plan that emphasizes eating fruits, vegetables, and low-fat dairy products, while discouraging the consumption of saturated and total fats. The diet is endorsed by the National Heart, Lung, and Blood Institute and the American Heart Association, and forms the basis for the United States Department of Agriculture's newest food pyramid. It is associated with reductions in SBP ranging from 8-14 mm Hg, and can help reduce and control weight and sodium intake[83].

Dietary Sodium Intake

The average American consumes 4000-6000 mg of sodium per day. I recommend that patients limit sodium intake to 2000 mg per day, which can reduce SBP by 5-10 mm Hg. This is a challenging endeavor: although most patients are compliant in avoiding and restricting table salt, few make the effort to read food labels and track intake. It is important to emphasize to patients that many medications, including ACE inhibitors and ARBs, are not as effective when sodium intake remains high [83].

Physical Activity

Fewer than 20% of Americans exercise regularly. However, regular aerobic activity—at least 30 minutes per day, most days of the week—can produce reductions in SBP of up to 9 mm Hg. Alcohol Consumption The JNC 7 define 2 drinks as 24 oz of beer, 10 oz of wine, or 3 oz of 80-proof whiskey. Consumption of 1-2 drinks per day may decrease SBP; however, more than 2 drinks per day increases blood pressure. The guidelines recommend that men limit alcohol consumption to 2 drinks per day, and women and lightweight people limit intake to 1 drink per day [83].

V. METHODOLOGY

PLACE OF STUDY

The study was conducted at Hakeem Abdul Hameed Centenary Hospital, Jamia Hamdard , New Delhi – 110062, India.

STUDY DESIGN

It was a single Centre, prospective, observational study on Gram-negative severe sepsis/septic shock patients.

STUDY DURATION

This study was conducted over a period of 36 months from August- 2019 to April -2022.

SAMPLE SIZE

The prevalence of hypertension of 27.5%, in Delhi [56],by the previous literature. A minimum of 165 subjects was required with CI (confidence Interval) of 95% at 10% absolute precision. Sample size was calculated by n-Master (2.0) software.

Sample size

Precision	**95% CI**
10%	**≥165**

INCLUSION CRITERIA

a) Elderly patients male ≥50 yr and female ≥ 45yr

b) Patients with > 140/90 mm of Hg

c) All menopausal female with BP > 140/90 mm of Hg

d) Systolic blood pressure >140 mm of Hg

e) Patients who are agree to give the consent will be included

EXCLUSION CRITERIA

a) Patient with age of < 50 yr and female < 45yr (or non-menopausal)

b) Patients with ≤ 140/90 mm of Hg

c) Those patients who will not agree to give his consent

d) Patients with other chronic diseases

VISCRAL ADIPOSITY INDEX CALCULATION

FEMALES: VAI= [WC/36.58+ (1.89X BMI)] X (TG/0.81) X (1.52/HDL)

MALE: VAI= [WC/39.68+ (1.88 X BMI)] X (TG/1.03) X (1.31/HDL)

GFR CALCULATION

$$eC_{Cr} = \frac{(140 - \text{Age}) \times \text{Mass (in kilograms)} \times [0.85 \; if \; Female]}{72 \times \text{Serum Creatinine (in mg/dL)}}$$

VI. DATA COLLECTION

The study was conducted after approval from the Institutional Dean & Principle of HIMSR & HAHC-HOSPITAL. Informed consent form for participation was collected from patient prior to data collection. A data collection sheet was used to collect study specific data. The data was collected using various data sources as mentioned below. Sources of data:

a. OPD/IPD/MICU visiting patients

b. Personal interview with patients or his/her attendant

c. Medical prescribing records.

d. Patient's medication profile/treatment chart.

e. Laboratory investigation reports (if available)

The data was documented in a properly designed case record form (CRF), in which all the essential particulars/findings were added which can be documented after review of patient's data.

VII. STATISTICAL CONSIDERATION

The data had been maintained in a database prepared in excel. The data was divided various subheadings- demographics, anti-hypertensive drugs prescribed, calculated GFR and VAI.. Descriptive statistics was used to describe the variables in terms of frequency, percentage, mean and Standard Deviation. Logistic regression analysis and independent t-test were used to determine the variables associated with mortality. SPSS v.20.0 statistical software was used to analyze the variables. A probability value (p-value) of <0.05 was considered as statistically significant. All outcome events were recorded and summarized individually.

VIII. WORK FLOW

PLAN OF WORK

After confirmed diagnosis of hypertension about 200 patients from OPD who are willing to give his/her consent will be included (men ≥ 50 yr and women ≥ 45 yr)

All Demographic information will be recorded for each patient

Drugs prescribed to each patient alone or in combination with all relevant information will be noted

GFR and VAI will be calculated by using the standard formula

Patients will be segregated in individual groups on the basis of different medications prescribed to them

Single Follow up information will be recorded after standard time period (1 month aprx.)

Blood pressure recorded during follow-up and change in medication also recorded.

Various comparisons will be made with regard to changes in SBP vs different drug groups

Appropriate Statistical calculation will be made by using excel & IBM SPSSv20 software to check the significance of the data

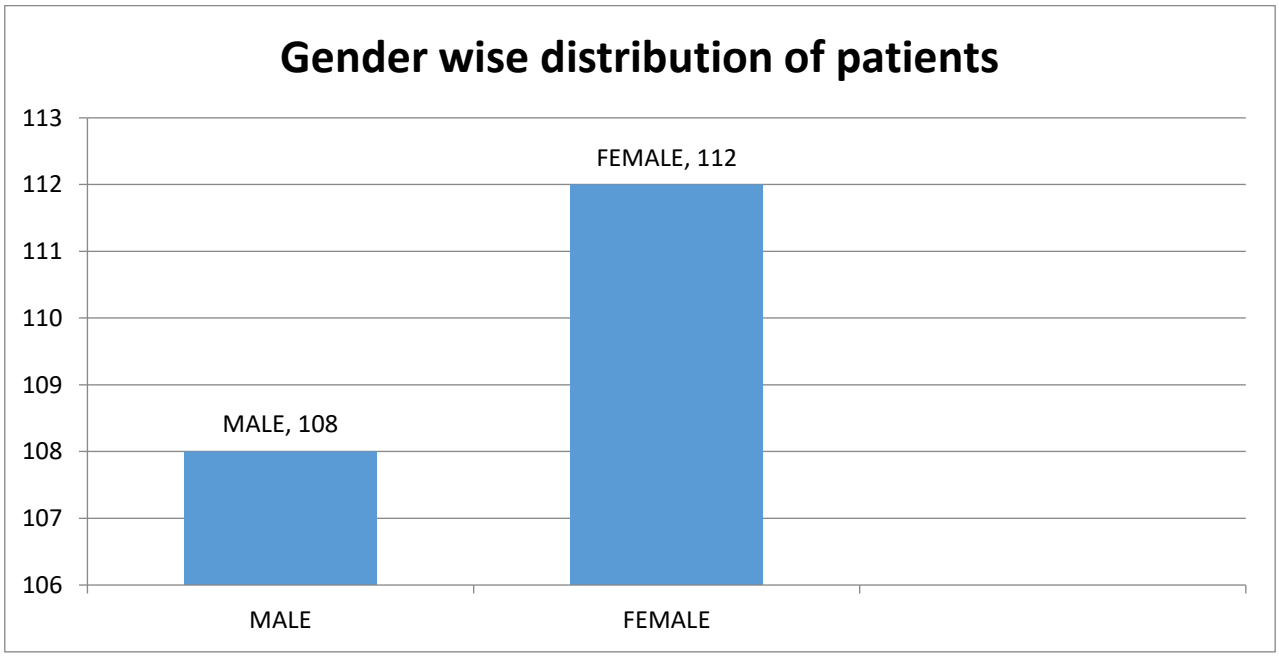
IX. RESULTS

Total number of patients enrolled was 230 and follow up taken of 220 patients (9 were drop out and 1 died due to diabetic complications). Patient participation was strictly abided by the provisions of inclusion and exclusion criteria and informed consent form (ICF) required before their admission in the study. The evaluated baseline data results are given below:

GENDER

Table no: 1. Gender wise distribution of patients

Gender	Frequency	Percentage (%)
MALE	108	49%
FEMALE	112	50.90%
TOTAL	220	100%



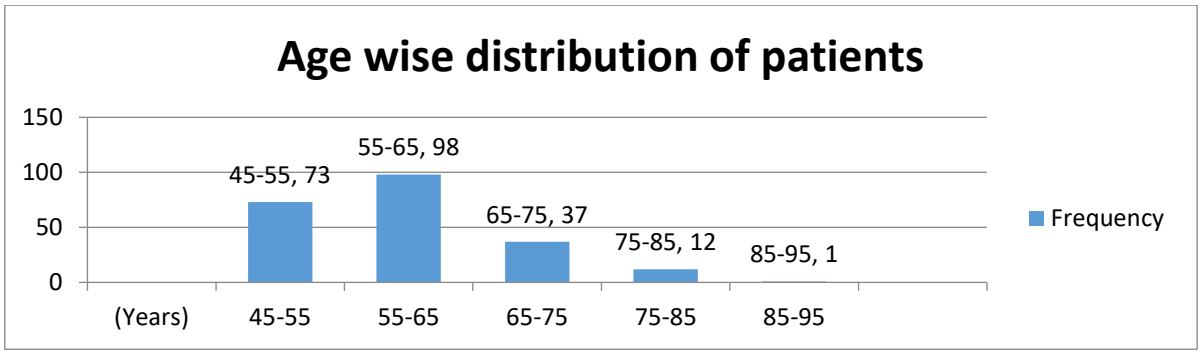
The study includes more female patients as compared to male patients. A total of 51% patients were female while 49% patients were male. There is significant correlation between gender and SBP. (P=0.002)

AGE

Table no: 2 Age wise distribution of patients

Age Group(Years)	Frequency	Percentage (%)

45-55	73	33.18%
56-65	98	44.54%
66-75	37	16.81%
76-85	12	5.45%
86-95	1	0.45%
Total	220	100%
Mean ± Standard deviation = 60.53 ± 9.25		



The maximum number of patients belongs to age group of 55 to 65 years which was 44.54% of total population followed by age group of 45 to 55 years which was 33.18% of total population. There is significant correlation between age and SBP.P value =0.036 <0.05 (significant)

SOCIOECONOMIC STATUS

Table no: 3 socioeconomic statuses

SES	Frequency	Valid Percent	Cumulative Percent
IV	123	55.90	55.90
III	66	30.0	85.9
II	31	14.09	100.0
Total	220	100.0	

The study reveals that 123 (55.90%) patients belongs to IV socioeconomic status patients followed by 66 (30%) to III socioeconomic status patients. There is negative correlation between SES and SBP. (P= - 0.51)

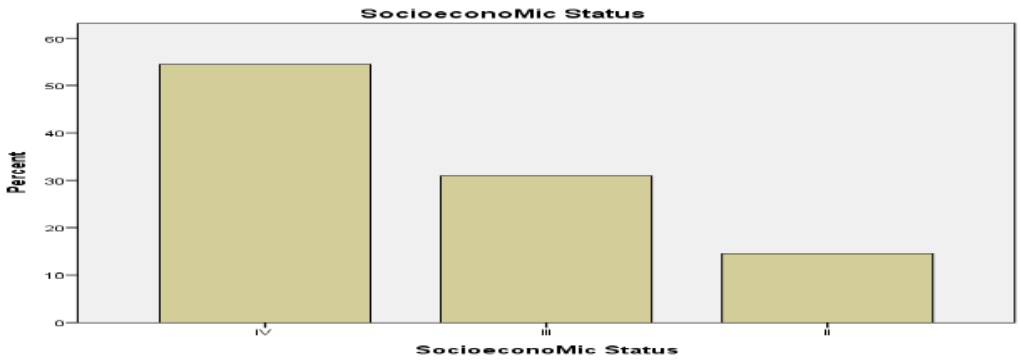
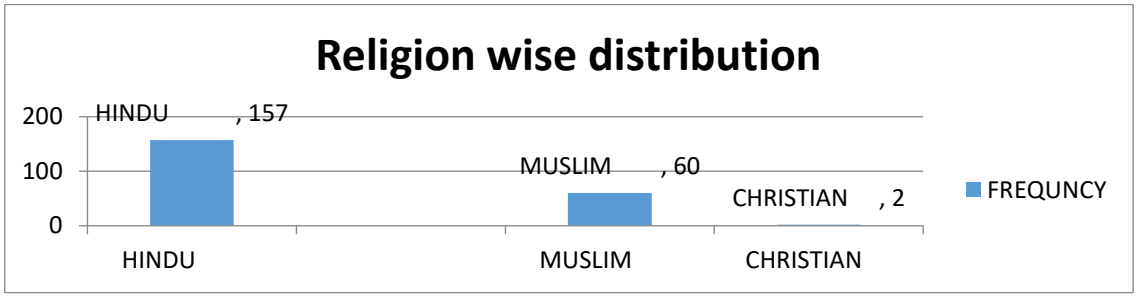


Table no:4 Religion wise distribution

RELIGION	FREQUNCY	PERCENTAGE

HINDU	157	71.36%
MUSLIM	60	27.27%
CHRISTIAN	2	0.90%
TOTAL	220	100%



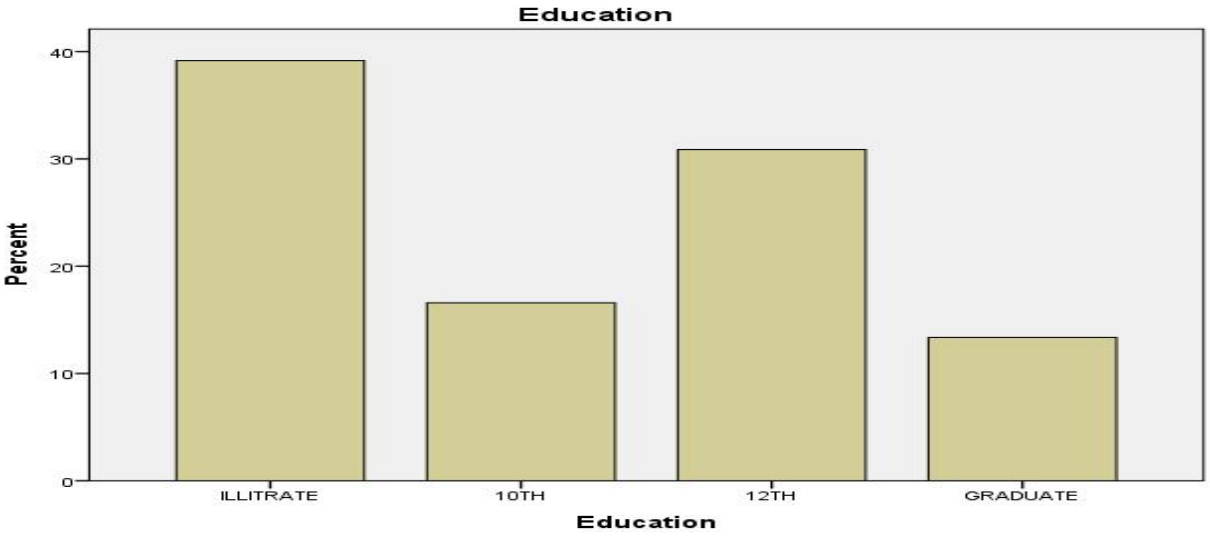
The maximum number of patients belongs to Hindu group, 157 patients (72%) of total population followed by Muslim group, 60 patients (27%) of total population. There is negative correlation between religion and SBP (P= -0.133).

EDUCATION WISE DISTRIBUTION

Table no: 5 Education cumulative percent

	Frequency	Valid Percent	Cumulative Percent
ILLITRATE	85	39.2	39.2
10TH	36	16.6	55.8
12TH	67	30.9	86.6
GRADUATE	29	13.4	100.0
Total	220	100.0	

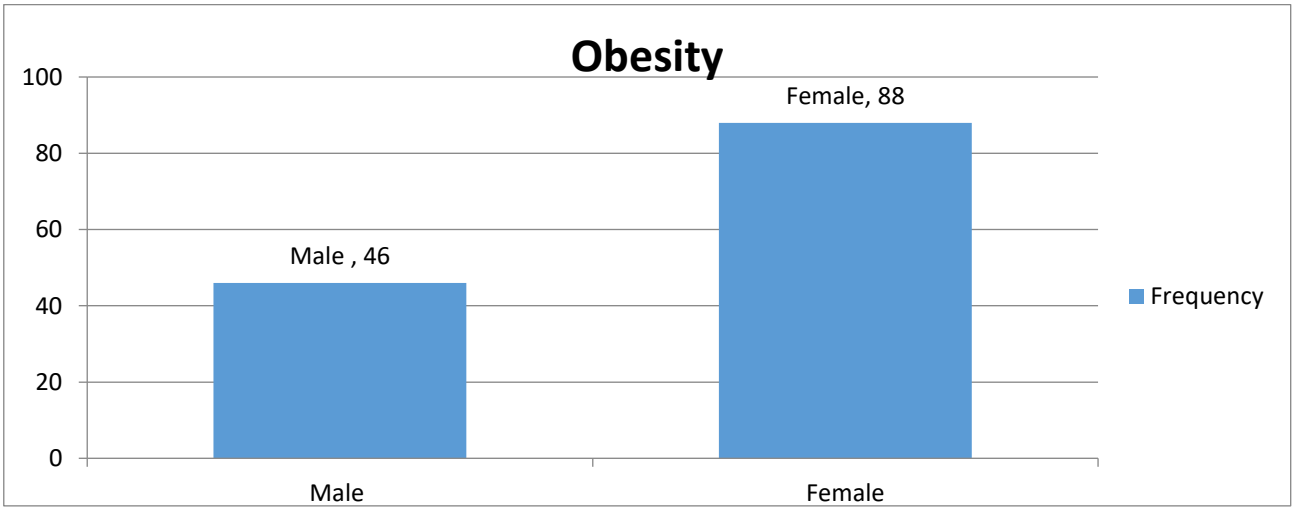
This study reveals that illiterate patients are more hypertensive as compare literate patients. There is negative correlation between SBP and education. (P= -0.045)



OBESITY

Table no:6 Total no of obese and non-obese patients

	Total Patients (male/female)	Obese Patients	Non-obese Patients
Male	108(49.1%)	46(34.32%)	62(28.18%)
Female	112(50.90%)	88(65.67%)	24(10.90%)
Total	220 (100%)	134 (100%)	86 (100%)

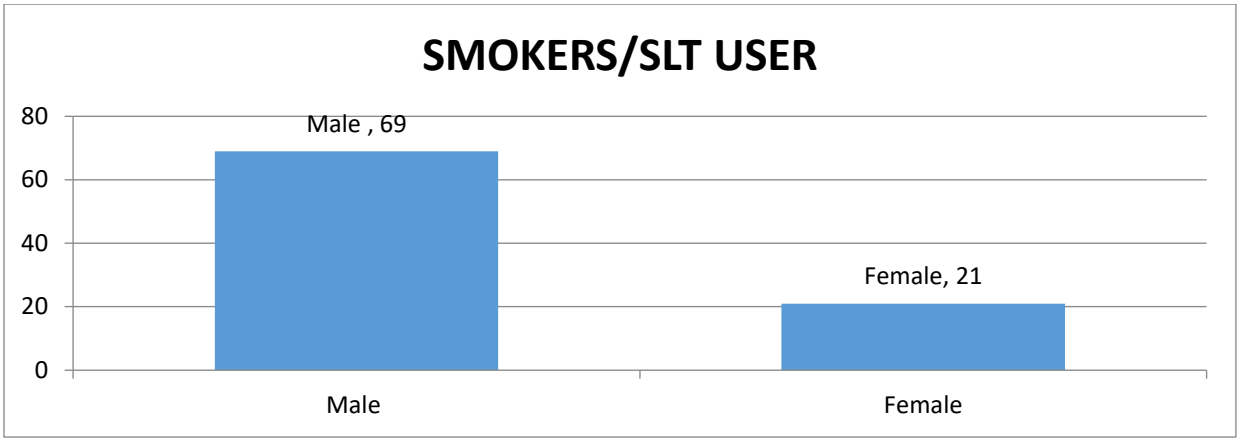


The study depicts that obese patients (134) were more hypertensive as compared to non-obese patients (86). Among the 134 obese patients female patients were 88(65.67%) and male patients were 46 (34.32%) There is significant relation between obesity and SBP (P value=0.041).

SMOKERS/SLT USER

Table no: 7

Gender	Total no	Smokers/slt user (%)	Non-smoker
Male	108 (49.1%)	69 (31.36%)	39 (17.72%)
Female	112 (50.9%)	21 (9.54%)	91 (41.36%)
Total	220(100%)	90 (40.90%)	130 (59.09%)



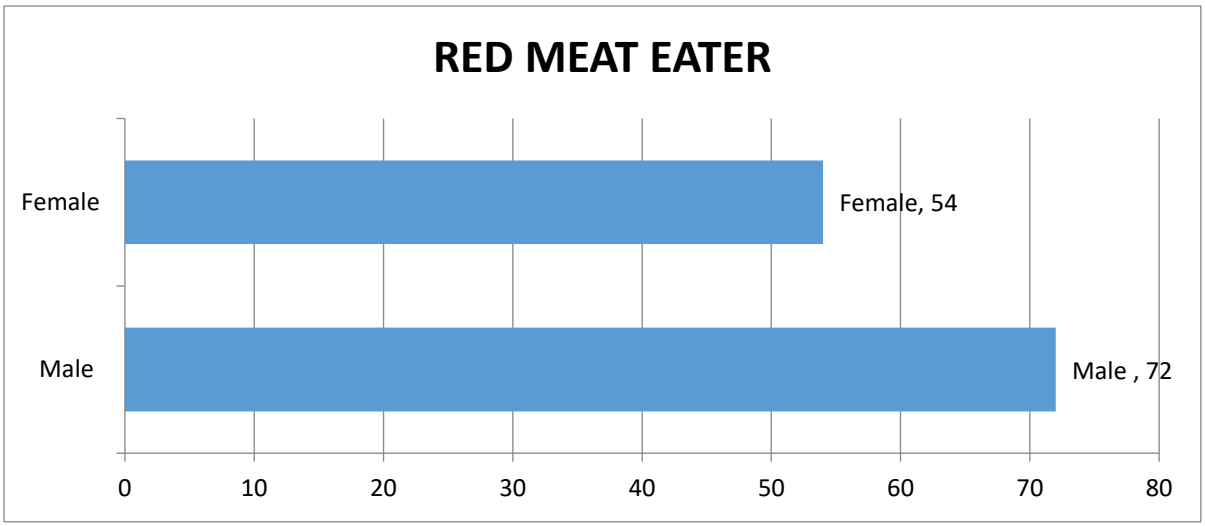
The study documented that among the 220, hypertensive patients, 40.90% (90) patients were smoker/slt user and 59.09% (130) were non-smoker/non slt user. The habits of smoking/slt were seeing more in male patients (31.36%) as compared to female patients (9.54%). There is positive correlation between smoker/slt users because the p value is equal to 0.05. (P=0.05)

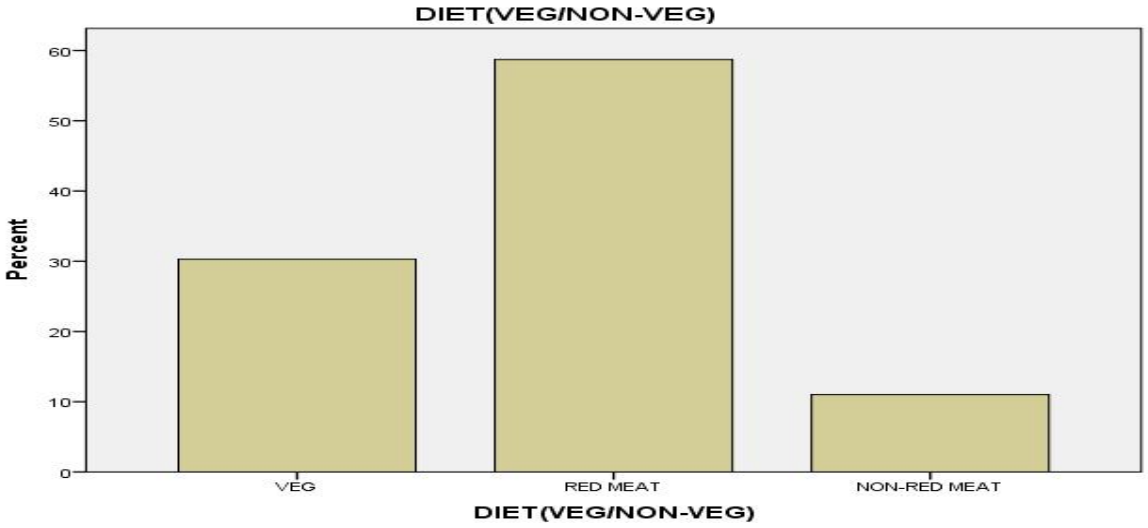
RED MEAT EATER

Table no: 8

Gender	Total no (%)	Red meat eater (%)	Non- Red meat eater
Male	108 (49.1%)	72(32.72%)	36(16.36%)
Female	112 (50.9%)	54(24.54%)	58(26.36%)
Total	220(100%)	126(57.27%)	94(42.72%)

The study demonstrated that more male patients were red meat eater as compared to female patients. A total of 32.72% patients were male while 24.54% patients were female. This study also reveals that red meat eaters (57.27%) are more hypertensive. There is significant correlation between non-veg eater and SBP **(P= 0.029)**





JUNK FOOD EATER

Table no: 9

Gender	Total no (%)	junk food eater (%)	Non-junk food eater (%)
Male	108 (49.1%)	100 (45%)	8(3.63%)
Female	112 (50.9%)	90(40.90%)	22(10%)
Total	220(100%)	190(86.36%)	30(13.63%)

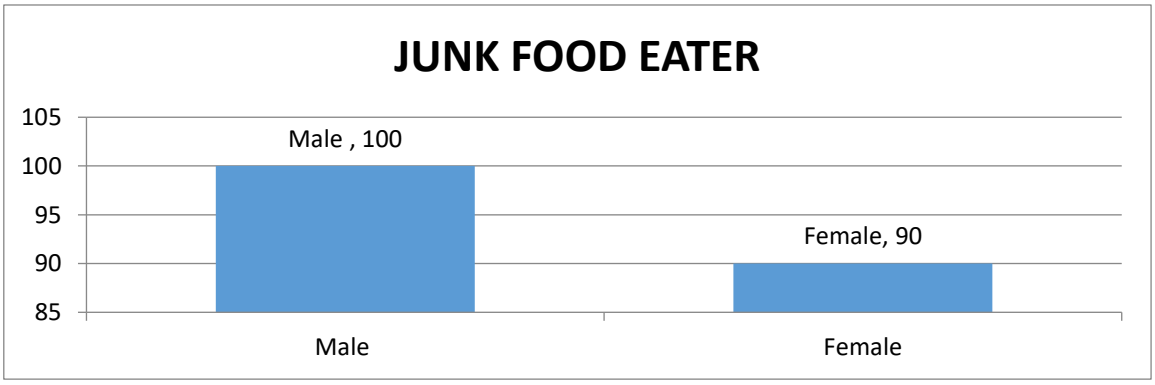
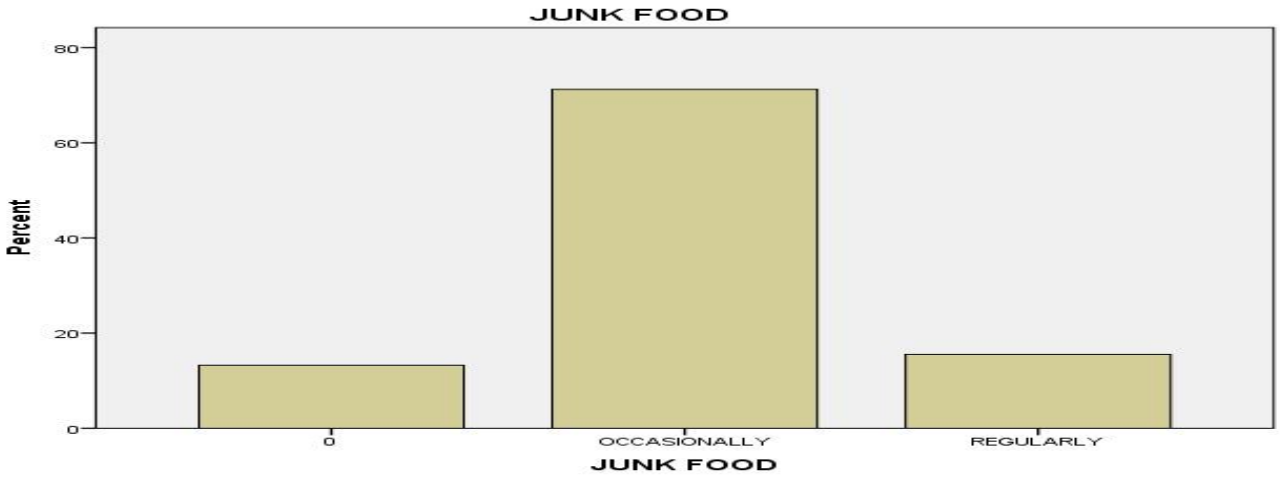


Table no: 10

JUNK FOOD	Frequency	Valid Percent	Cumulative Percent
NEVER	29	13.2 %	13.2
OCCASIONALLY	156	71.2 %	84.5
REGULARLY	34	15.5 %	100.0
Total	220	100.0 %	

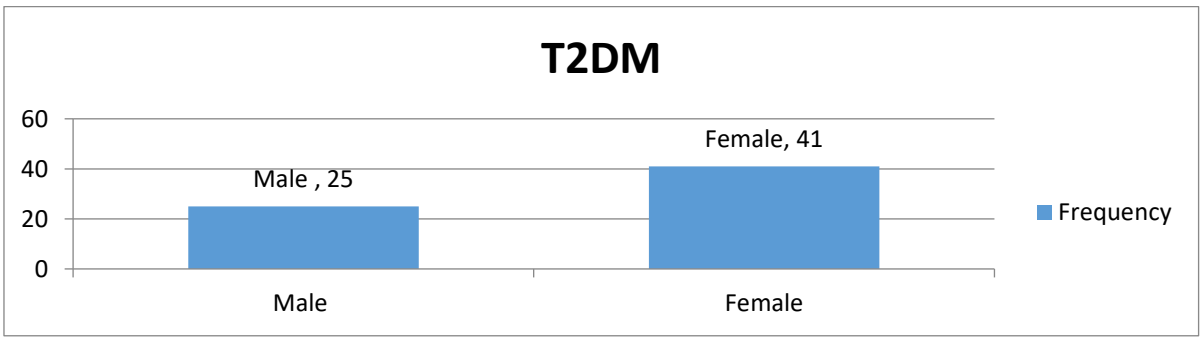


The study leads to conclude that out of 220 hypertensive patients, 190 (86.36%) patients were junk food eater and 30 (13.63%) patients were non-junk food eater. The habit of junk food eating was more in male patients 100(45 %%) as compared to female patients 90 (40.90%). There is positive correlation between junk food eater and SBP. (P=0.018)

T2DM

Table no: 11

Gender	Total no (%)	T2DM (%)	Non- T2DM
Male	108 (49.1%)	25 (11.36%)	36(16.36%)
Female	112 (50.9%)	41 (18.63%)	58(26.36%)
Total	220(100%)	66 (30%)	94(42.72%)



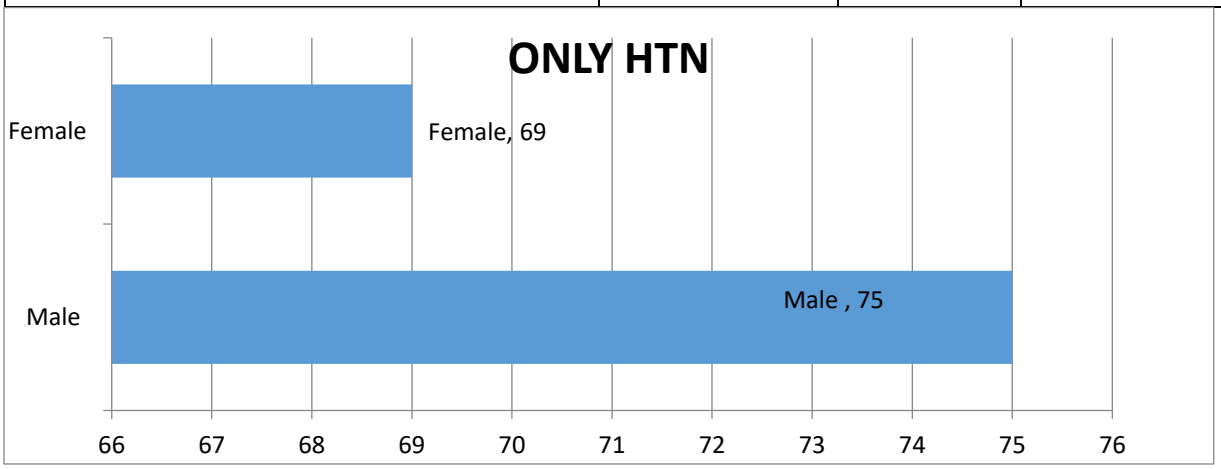
The study leads the conclusion that only 66 (30%) patients were having T2DM out of 220 hypertensive patients and among the T2DM patients female patients were more 41(18.63%) as compared to male patients 25(11.36%) There is no significant correlation between T2DM and SBP (P=0.076 > 0.05).

HTN WITHOUT ANY OTHER MORBIDITY

Table no: 12

Gender	Total No (%)	Only HTN	PERCENTAGE
Male	108 (49.1%)	75	34.09%
Female	112 (50.9%)	69	31.36%

Total	220(100%)	144	65.45%

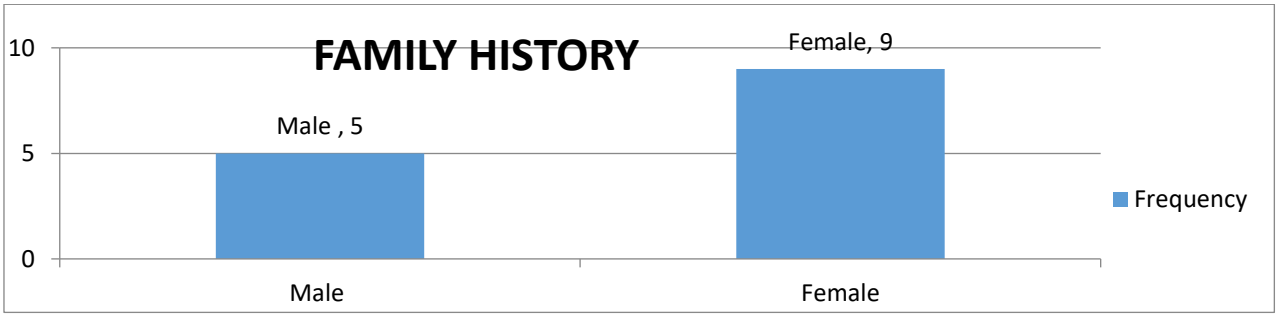


The study includes more male patients were having only HTN as compared to female patients. A total of 34.09% patients were male while 31.36% patients were female.

FAMILY HISTORY

Table no: 13

Gender	Total No (%)	Frequency	Percentage %
Male	108 (49.1%)	5	2.27%
Female	112 (50.9%)	9	4.09%
Total	220(100%)	14	6.36%



The study includes total 6.36% were having family history among them 2.27% were male and 4.09% were female.there is negetive correlation between family history and SBP (P= -0.086).

Table no: 31 Descriptive statistics of lab investigations by multiple regression (IBM SPSS 2.0)

Descriptive Statistics

	Mean	Std. Deviation
BP(MMHg) SBP	172.66	16.766
Creatinine	1.227273	.5222330
Urea	34.045455	14.8933488
WBC(TLC)	7765.91	4101.273
RBC	4.05	.429
K+	4.086364	.7293166
Na+	139.591	3.7869
Ca++	8.581364	.9230626
ALKALINE PHOSPHATE	124.98	107.300
SGOT	28.41	5.512
ALBUMIN (g/dL)	3.664	.6830
HDL	53.068182	19.6686478
LDL	86.3409	20.74198
TG	136.8864	41.53128
C-RP	.09	.291
CL-	105.727273	4.7415219
VAI	11.250000	5.4136992
GFR	64.477273	26.6523603

Table no: 14 CORRELATIONS OF SBP WITH LAB INVESTIGATION

		BP(MMHg) SBP
Pearson Correlation	BP(MMHg) SBP	1.000
	Creatinine	.352
	Urea	.501
	WBC(TLC)	.176
	RBC	.322
	K+	-.090
	Na+	.135
	Ca++	.108
	ALKALINE PHOSPHATE	-.109
	SGOT	.191
	ALBUMIN (g/dL)	-.161
	HDL	.128
	LDL	-.216
	TG	.142
	C-RP	-.041
	CL-	.099
	VAI	.106
	GFR	-.538

The study reveals that K^+ is negatively correlated with SBP (P= -0.090), ALP is negatively correlated with SBP (P= -0.109), Albumin is negatively correlated with SBP (P=- 0.161), LDL is negatively correlated with SBP (P= -0.216), Crp is negatively correlated with SBP (P= - 0.041), GFR is negatively correlated with SBP (P= - 0.538) & VAI is not correlated with SBP (P=0.106).

X. DISCUSSION

Uncontrolled or poorly controlled systolic hypertension is a major risk factor for cardiovascular morbidity and mortality in the elderly population (WHO, 2004). Proper controlled of SBP by using appropriate medicine may improve the quality of life and productivity of the elderly population.

In this study all the patients included were belong to elderly category i.e. Elderly patient's male ≥50 yr and female ≥ 45yr. In this study female patients (51 %) were more hypertensive as compared to male patients (49 %). As Jane F. Reckelhoff et al., 2001 has reported that Men are at greater risk for cardiovascular and renal disease than are age-matched, premenopausal women [84]. This study

reveals that post-menopausal women are at greater risk to have hypertension. Priscilla et al., 2008 has reported that Women have lower systolic blood pressure (SBP) levels than men during early adulthood, while the opposite is true after the sixth decade of life. Diastolic blood pressure (DBP) tends to be just marginally lower in women than men regardless of age. Midha T et al., 2010 has suggested that the prevalence of ISH according to JNC-7 criteria was 4.3%, which was 5.1% in men and 3.6% in women [12]. A significant increase in the prevalence of ISH was seen with an increase in age. Multivariate logistic regression analysis of the determinants showed that age, BMI and smoking were significant independent risk factors of ISH.

Age

According to the age distribution the results shows that age group between 56-65 years having 44.54 % hypertension followed by 45-55 years (33.18%) age group. There is significant correlation between SBP and age (P=0.036<0.05) and by this we can conclude that as the age increases the incidence of isolated systolic hypertension also increases. C.R. Mandal et al., 2012 has also concluded that there exists a significant association of ISH and age[12]. The prevalence was highest in ≥60 year's age group (21.21%) and lowest in 20-29 years age group (2.23%). Prevalence was 33.19% in 30-39 years age group followed by 6.27% in 40-49 years age group and 8.49% in 50-59 years age group. Thus an increasing trend of prevalence with advancement in age was perceptible.

Socioeconomic status

Socioeconomic status of hypertensive patients is estimated by the modified Kuppuswamy scale, (55.90%) patients were from class IV followed by 66 (30%) patients were from class III. There is a significant negative correlation between Socioeconomic status and SBP (P= -0.051). Zygmuntowicz M et al., 2011 has also shown in his study that as the socioeconomic status decreases the hypertension increases [85].

Religion

Religion also seen in this study and found that the maximum number of patients belongs to Hindu group, 157 patients (72%) of total population followed by Muslim group, 60 patients (27%) of total population. There is negative correlation between religion and SBP (P= -0.133). Gupta R et al., 2002 has concluded in his study that the prevalence of CHD is significantly more in Hindu males as compared to the Muslims and is associated with a greater prevalence of diabetes and hypertension.

Education

In education wise distribution this study reveals that illiterate patients are more hypertensive as compare literate patients. There is negative correlation between SBP and education. (P= -0.045). Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure.,1993,American Association of Diabetes Educators1995 and Grueninger UJ et al., 1995 have concluded that education is negatively correlated with hypertension[86]. Gupta R et al., 2002 concluded in his study that prevalence of illiteracy and sedentary lifestyle was significantly more in Muslims.

Obesity

This study includes more female obese patients as compared to male patients. A total of 40% patients were female while 20.9% patients were male. More obese patients (60.9%) were hypertensive as compare to non-obese patients. There is significant relation between obesity and SBP (P value=0.41). David W. Harsha et al., 2008 has concluded that overweight and obesity are established risk factors for cardiovascular disease (CVD), stroke, noninsulin dependent diabetes (NIDDM), certain cancers, and numerous other disorders. It is also a risk factor for hypertension [87].

Smoker/SLT User

The study includes more male patient's smoker/SLT user as compared to female patients. A total of 31.36% patients were male while 9.54% patients were female. 90 patients (41%) were smoker/SLT user, there is non-significant relation was seen between smoker/SLT user and SBP. C.R. Mandal et al., 2012 has concluded that Occurrence of ISH was found to be comparatively higher among who smoke regularly (5.42%) than that of individuals who do not smoke (3.31%). Association of smoking habit with ISH prevalence was found to be non-significant. Frequency of ISH was found to be higher among the individual with tobacco chewing habit (7.75%) than that of the individual without tobacco chewing habit

(4.17%). In application of Chi² statistical significant difference was found in case of this determinant ($\chi 2$ = 5.85; Significant, P values <0.05).

Red meat eater

This study depicted that male patients were red meat eater as compared to female patients. A total of 32.72% patients were male while 24.54% patients were female. This study also reveals that red meat eaters (57.27%) are more hypertensive as compared to non-red meat eater. There is significant correlation between non-veg eater and SBP (P= 0.029). Several dietary constituents including sodium total calories, saturated fat, and alcohol have been shown to be positively related to blood pressure (BP). Potassium, calcium, magnesium, polyunsaturated fat, and fiber appear to be inversely related to BP. The vegetarian diet tends to be low in the factors positively related to BP, and high in the protective factors (except for calcium in the diet of strict vegetarians who consume no dairy products). Crosssectional studies of White adults in Australia, Israel, and the United have found lower BP among vegetarians than non-vegetarians [88].

Junk food

The study includes more male patients were junk food eater as compared to female patients. A total of 45% patients were male while 41% patients were female. In this study 190(86.36%) patients were junk food eater out of 220; this shows positive correlation between junk food eater and SBP. Hopping BN et al., 2010, Carter OB et al., 2011, Cizza G et al., 2011 has concluded in their study that junk food or fast food both correlated with obesity and low nutrient quality which leads to increase in hypertension indirectly [89].

T2DM

The study leads to conclusion that female patients were having more T2DM with HTN as morbidity as compared to male patients. A total of 26.36% patients were female while 16.36% patients were male. Total of 66 patients were having T2DM with HTN out of 220 patients. There was no significant correlation between T2DM and SBP (P=0.076 > 0.05). Hopping BN et al., 2010 has concluded that the hypertension and diabetes both are lifestyle disorder depends on junk food and can be reduced by lifestyle modification and both are correlated with each other. **Long AN et al., 2011** has concluded in his study that up to 75% of adults with diabetes also have hypertension, and patients with hypertension alone often show evidence of insulin resistance [90]. **Evelyn P et al., 2008** has documented that diabetes without complication was the most common comorbidity of unspecified and malignant hypertensive patients; abnormal lipid metabolism was the most common co-morbidity of benign hypertensive patients.

This study also concluded that only 6.36% patients were having family history among them 2.27% were male and 4.09% were female. There is negative correlation between family history and SBP (P= -0.086).there is not significant previous study available.

Visceral adiposity index

Visceral adiposity index has no significant correlation with SBP (P=0.121) although waist circumference positively correlated with SBP (P=0.04). Hayashi T et al (2003) has documented that greater visceral adiposity increases the odds of hypertension in Japanese Americans independent of other adipose depots and fasting plasma insulin in support of this Amato MC et al (2014) has also documented that the VAI among the most common indexes of adiposity assessment, shows the best correlation with the best known adipocytokines and cardiometabolic risk serum markers and the VAI would be an easy tool for clearly mirroring a condition of cardiometabolic risk [91].

CONCLUSION

Morbidity and mortality are increased by elderly hypertension. The number of elderly hypertension patients will increase for practitioners as the US aging population rises. Most ISH in elderly hypertension. Most difficult to treat. Evidence is quite strong for treating ISH. SBP management must come before DBP reduction. Clinical studies demonstrate that lowering SBP lowers cardiovascular and renal disease more than keeping SBP uncontrolled. Prioritizing elderly SBP management is necessary [92].

Stroke, coronary heart disease, heart failure, and end-stage renal disease are all made more likely by hypertension. Therefore, hypertension prevention is essential for blood pressure regulation as well as to avoid negative effects on the kidneys and cardiovascular system. Age, gender, genetic

characteristics, race, excessive salt intake, inadequate potassium intake, alcohol usage, and little physical exercise are modifiable risk factors for hypertension. These determinable factors, according to study, reduce blood pressure and avoid hypertension. Therefore, according to current national guidelines, obese individuals should lose weight, engage in regular isotonic exercise, eat a low-sodium diet (100 mmol/d), take potassium supplements, and consume moderate amounts of alcohol (1 ounce of ethanol or its equivalent per day).

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